HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Spring Chinook Salmon
Species or Hatchery Stock:	Carson Stock Spring Chinook Salmon (*Oncorhynchus tshawytscha*)
Agency/Operator:	U.S. Fish & Wildlife Service Little White Salmon/Willard NFH Complex
Watershed and Region:	Little White Salmon River
Date Submitted:	10/07/2002
Date Last Updated:	10/04/2002

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Spring Chinook Program - Little White Salmon/Willard NFH Complex.

1.2) Species and population (or stock) under propagation, and ESA status.
Carson stock Spring Chinook Salmon (*Oncorhynchus tshawytscha*). This population is not listed under the Endangered Species Act.

1.3) Responsible organization and individuals

Name (and title): Lee Hillwig (Fish and Wildlife Administrator)
Agency or Tribe: U.S. Fish and Wildlife Service (Service)
Address: 911 N.E. 11th Avenue, Portland, Oregon 97232
Telephone: (503) 872) 2766
Fax: (503) 231-2062
Email: lee_hillwig@fws.gov

Name (and title): Speros Doulos (Complex Manager)
Agency or Tribe: Little White Salmon/Willard NFH Complex
Address: 56961 S.R. 14, Cook, WA 98605
Telephone: (509) 538-2755
Fax: (509) 538-2880
Email: speros_doulos@fws.gov

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- National Marine Fisheries Service (NMFS) - funding agency via Mitchell Act.
- Confederated Tribes of the Umatilla Indian Reservation (CTUIR) receives production for tribal restoration program.
- U.S. *v* Oregon parties - co-managers of fisheries.

1.4) Funding source, staffing level, and annual hatchery program operational costs.
Funding for the program is from Mitchell Act funds administered by NMFS. The Little White Salmon NFH has a staff of thirteen full time employees and an annual budget of $1.14 million in Fiscal Year 2002. The budget for the spring Chinook program was $350,476 from Mitchell Act funds.

1.5) Location(s) of hatchery and associated facilities
Little White Salmon NFH is located on the Little White Salmon River at river kilometer 2, approximately 19 kilometers east of Stevenson, Washington. The hatchery is situated just above Drano Lake, a water body where the Little White Salmon River joins the Columbia River at river kilometer 261. This position is approximately 45° 42' 30" North

Latitude and 121° 37' 30" West Longitude (pers. comm. Steve Vigg, NMFS). Site elevation is about 27 meters above sea level.

1.6) Type of program.

Isolated harvest

1.7) Purpose (Goal) of program.

Little White Salmon NFH Program:

The purpose is to successfully rear and release 1,000,000 locally adapted yearling spring Chinook salmon smolts for release on-station to help mitigate (production for fisheries) for fish losses in the Columbia River Basin caused by mainstem hydro-power project construction and other developments. Fish releases contribute to important terminal area tribal ceremonial and subsistence fisheries, and non-tribal sport fisheries, while providing adequate escapement for hatchery production. Mainstem commercial fisheries have been precluded in recent years because of the very low abundance of naturally spawning populations of spring Chinook (principally from the Snake River and upper Columbia River basins) that are now listed under the ESA. Hatchery operations strive to meet mitigation requirements of the Mitchell Act and the Columbia River Fish Management Plan goals (U.S. *v* Oregon). The Columbia River Fish Management Plan is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan.

Umatilla Program:

The purpose is to rear and transfer locally adapted spring Chinook salmon to the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Juveniles are released into the Umatilla River, Oregon in cooperation with the State of Oregon and the Umatilla Tribe to support development of self sustaining, naturally spawning fish. Adults returning to the Umatilla River are collected at Threemile Dam. A small percentage of fish are collected and spawned. The remaining fish are then trucked and released upstream and allowed to spawn naturally to continue development of locally adapted, self-sustaining and naturally spawning populations. A total of 350,000 juveniles are transported to and reared at the Little White Salmon/Willard National Fish Hatchery Complex for one and one-half years and transferred to acclimation ponds on the Umatilla River operated by the CTUIR. This project is funded by the Bonneville Power Administration (BPA) and is a cooperative effort between the CTUIR, the Oregon Department of Fish and Wildlife (ODFW), and the Service. The ODFW and CTUIR are responsible for the monitoring and evaluation program necessary to determine the success of this restoration effort. The Umatilla program is not evaluated in this HGMP. It will be covered under a separate HGMP for the BPA funded Umatilla tribal program.

1.8) Justification for the program.

Little White Salmon River Program:

The Little White Salmon/Willard NFH Complex (Complex) currently operates as part of the Columbia River Fisheries Development Program and is funded through the Mitchell Act - a program to provide for the conservation of Columbia River fishery resources. This program is a part of the mitigation for habitat loss resulting from flooding, siltation, and fluctuating water levels caused by Bonneville Dam. The Columbia River Fish Management Plan is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan.

1.9) List of program "Performance Standards".

The following standards are adapted from IHOT (1995).

1) Hatchery Production
   Produce 1.0 million spring Chinook smolts for on-station release.
   Produce 350,000 spring Chinook smolts for transfer.

2) Minimize interactions with other fish populations through proper rearing and release strategies.

3) Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

4) Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

5) Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

6) Communicate effectively with other salmon producers and managers in the Columbia River Basin.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

BENEFITS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
1. Provide predictable, stable, and increased opportunity for harvest.	Adult survival and annual contribution to recreational, commercial and tribal fisheries.	Continued analysis of CWT returns through CRiS and PSMFC database (see Table A).
2. Achieve genetic and life history conservation.	Isolation of species from others returning at the same time. Annual evaluation of life history characteristics See section 3.5 on genetic effects on other species. *NA for mitigation hatcheries (APR 1999).*	Separation by species (see section 7.6). Annual monitoring of: juvenile preparedness for seawater entry, fecundity, body size, sex ratio, distribution and straying (through CRiS)
3. Enhance local, tribal, state, regional and national economies.	Contribution to all fisheries established.	No economic evaluation is conducted on a local level.
4. Fulfill legal/policy obligations.	Legal and policy goals established by US v Oregon and John Day Dam Mitigation policies are met (note: there are no policy goals for numbers to the fishery, only for production goals).	Annual evaluation of fish counted in the fishery. Production goals are met annually.
5. Contribution of fish carcasses to ecosystem function by subbasin and by hatchery.	Hatchery Research Monitoring and Evaluation (RM & E) plans in IHOT.	Carcasses are not outplanted due to disease concerns (See sections 3.5.4 and 7.8).
6. Provide fish to satisfy legally mandated harvest.	See sections 2.2.1 and 2.2.2.	There are no other affected stocks in the watershed.

BENEFITS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
7. Will achieve within-hatchery performance standards.	IHOT standards	IHOT standards are met See sections 1.8, 1.9, 1.12, 3.2, 4.1, 5.8, 7.7, 7.9, 8.3, 10.11.
8. Restore and create viable naturally spawning populations.	No spawning habitat available.	NA
9. Plan and provide fish with coordinated mainstem passage and habitat research.	Developed release protocols. *NA for mitigation hatcheries (APR 1999).*	Releases annually determined to coincide with expected maximum river flows (see section 10.4)**.**
10. Conduct within-hatchery research, improve performance or cost effectiveness of artificial production hatcheries to address the other four purposes (augmentation, mitigation, restoration and conservation).	Research on performance indicators *NA for mitigation hatcheries (APR 1999).*	Onsite evaluation of physiological condition of released fish to reduce ecological interactions (more in section 9.2.8) Also see sections 9.2.9 and 12.
11. Minimize management, administrative, and overhead costs.	IHOT audits conducted on a regular schedule. *NA for mitigation hatcheries (APR 1999).*	IHOT audits as scheduled and results integrated (see sections 1.8, 1.9, 3.2, 3.5, 4.1, 5.8, 7.7, 7.9, 8.3, 10.11).
12. Improve performance indicators to better measure performance standards.	Adaptive management. *NA for mitigation hatcheries (APR 1999).*	Continuous adaptive management: e.g. implementation of naturally colored raceways (section 9.2.9) and annual monitoring of seawater tolerance (see section 9.2.8).

RISKS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*

RISKS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
1. Develop harvest management plan to protect weak populations where mixed population fisheries exist.	This is an isolated harvest program. Little if any interaction with other populations are expected. Harvest is consistent with NMFS Biological Opinions.	Performance of spring Chinook are monitored for distribution and straying (via CWT collections). Genetic introgression with other stocks is unlikely (see section 3.5). Co-managers develop Biological Assessments for fisheries.
2. Do not exceed the carrying capacity of fluvial, lacustrine, estuarine, and ocean habitats.	RM & E plans established.	No research has been conducted on this topic previously or currently.
3. Assess detrimental genetic impacts among hatchery vs. wild where interactions exist.	Evaluation of stray rates.	Continuous evaluation with CWT collections of the subsample of juveniles released with CWTs.
4. Unpredictable egg supply leading to poor programming of hatchery production.	Implement annual evaluation of adult returns.	Achieve percent egg take goal in 4 out of 5 years (See sections 6.2.1 and 7.4.2). IHOT disease protocols implemented (See sections 7.7 and 7.9).
5. Production cost of program outweighs the benefit.	Evaluate trends in juvenile production cost.	Montgomery Watson 1997 Hatchery Evaluation report (part of IHOT evaluation).
6. Cost effectiveness of hatchery ranked lower than other actions in subregion or subbasin.	Social/economic effectiveness.	This has not been and is not being evaluated.
7. Will not achieve within-hatchery performance standards.	Comparative evaluation of within-hatchery standards	IHOT standards are met annually.

RISKS *Performance standards*	*Performance Indicators*	*Monitoring and Evaluation*
8. Evaluate habitat use and potential detrimental ecological interactions.	No habitat available within the watershed adjacent to the hatchery. For impacts in other watersheds see section 3.5.	NA
9. Avoid disease transfer from hatchery to wild fish and visa versa.	Comply with IHOT standards and USFWS policy.	See sections 3.5, 4.1, 5.4, 5.8, 7.8, 7.9, 9.2.7, 10.11
10. Evaluate impacts on life history traits of wild and hatchery fish from harvest and spawning escapement.	Track trends of life history characteristics of hatchery fish (no wild fish in this system).	Annual evaluation of: Adult age distribution, fecundity, body size, sex ratio, juvenile size (e.g. data in section 9.2), distribution and straying (annual compilation of CWT data from the CRB).
11. Assess survival of captive broodstock progeny vs. wild cohorts.	*NA for mitigation hatcheries (APR 1999).*	
12. Depleting existing population spawning in the wild through broodstock collection.	*NA for mitigation hatcheries (APR 1999).*	

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

A total of 900 adult fish are required for normal full production. See Section 6.2.2 and Section 7.4.2.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Egg	N/A	N/A
Unfed Fry	N/A	N/A
Fry	N/A	N/A
Fingerling	N/A	N/A
Yearling	Little White Salmon R. Transfer to Umatilla River	1,000,000 350,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

The following is a program summary adapted from IHOT (1996) and updated for this document.

Measures	Hatchery Goal	5-Year Average	Range
Adult Capture[1]	900	4,485	1,191-8,243
Fish Releases[1]	1 Million	0.99 M	0.68-1.12M
Egg Transfers[1]	0	0	0
Fish Transfers[1]	350,000[3]	375,807	350,545 - 430,457
Adults Passed Upstream[1]	0	0	0
Percent Survival, Juvenile to Adult[2]	0.2%	0.24%	0.03% - 0.55%
Smolt Size at Release (fish/lb)[1]	15	15.26	14.3-15.9

[1] Five year average and range from calendar years1995-1999
[2] Five year average and range from completed brood years1991-1995
[3] Umatilla Program goal (begun in 1997)

1.13) Date program started (years in operation), or is expected to start.
The on-station program began in 1967.

1.14) Expected duration of program.
Ongoing.

1.15) Watersheds targeted by program.
Little White Salmon River Program:
The Little White Salmon River below Little White Salmon NFH (i.e. Drano Lake) is the target watershed. The Water Resource Inventory Number (WRIA) number is 29.0131.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

Mainstem Columbia River and Snake River Dam removal to restore habitat has been considered but is not currently regarded as a realistic alternative. Refer to the NMFS Hydrosystem Biological Opinion on the subject.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.
The hatchery has authorization under the NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin 1999. Section 7 permits were obtained for construction projects from NMFS (WSB-00-360 dated 06/28/2000 good through 09/30/2001) and from an Internal Section 7 Consultation (permit number 1-3-00-FW-1914, 1915) from the USFWS Western Washington Office in Lacey, Washington.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

See Addendum A for non-salmonid species.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.
There are no ESA listed salmonids that will be directly affected by the program in the target watershed. Refer to section 3.5 of this document for a detailed description of possible interactions throughout the migration corridor.

- Identify the ESA-listed population(s) that will be directly affected by the program.
There are no ESA listed salmonids that will be directly affected by the program in the target watershed. Refer to section 3.5 of this document for a detailed description of possible interactions throughout the migration corridor.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

There are no ESA listed salmonids that are anticipated to be affected by the program in the target watershed. Refer to section 3.5 of this document for a detailed description of possible interactions throughout the migration corridor.

2.2.2) <u>Status of ESA-listed salmonid population(s) affected by the program.</u>

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.
There are no known listed natural origin salmonids on natural spawning grounds in the Little White Salmon River.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.
There are no known listed natural populations in the Little White Salmon River.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.
There are no known listed natural populations in the Little White Salmon River.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.
This data is not available. There are no known listed natural populations in the Little White Salmon River.

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.</u>

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
In the event that listed species enter the facility during broodstock collection of adult spring Chinook, there is potential to take listed species through observation, migrational delay, capture, and handling during ladder operation at the Little White Salmon NFH between mid-May and early August. Trapping and handling devices and methods may lead to injury to listed fish through descaling, delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation.

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.

No listed species have been recorded entering the hatchery facility during spring Chinook operations.

-Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).
No take of listed species is anticipated.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.
If any listed species is identified entering the hatchery, they will immediately be returned to the river via a return tube that empties below the fish ladder entrance.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.
The hatchery program will be operated consistent with ESU-wide plans as listed in section 3.2.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.
The spring Chinook program is consistent with:
- NMFS 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- U.S. *v* Oregon Columbia River Fish Management Plan (currently under re-negotiation)
- Mitchell Act
- NPPC Little White Salmon River Subbasin Salmon and Steelhead Production Plan - hatchery production strategy
- Umatilla Annual Operation Plan
- IHOT Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries

This HGMP is consistent with these plans and commitments.

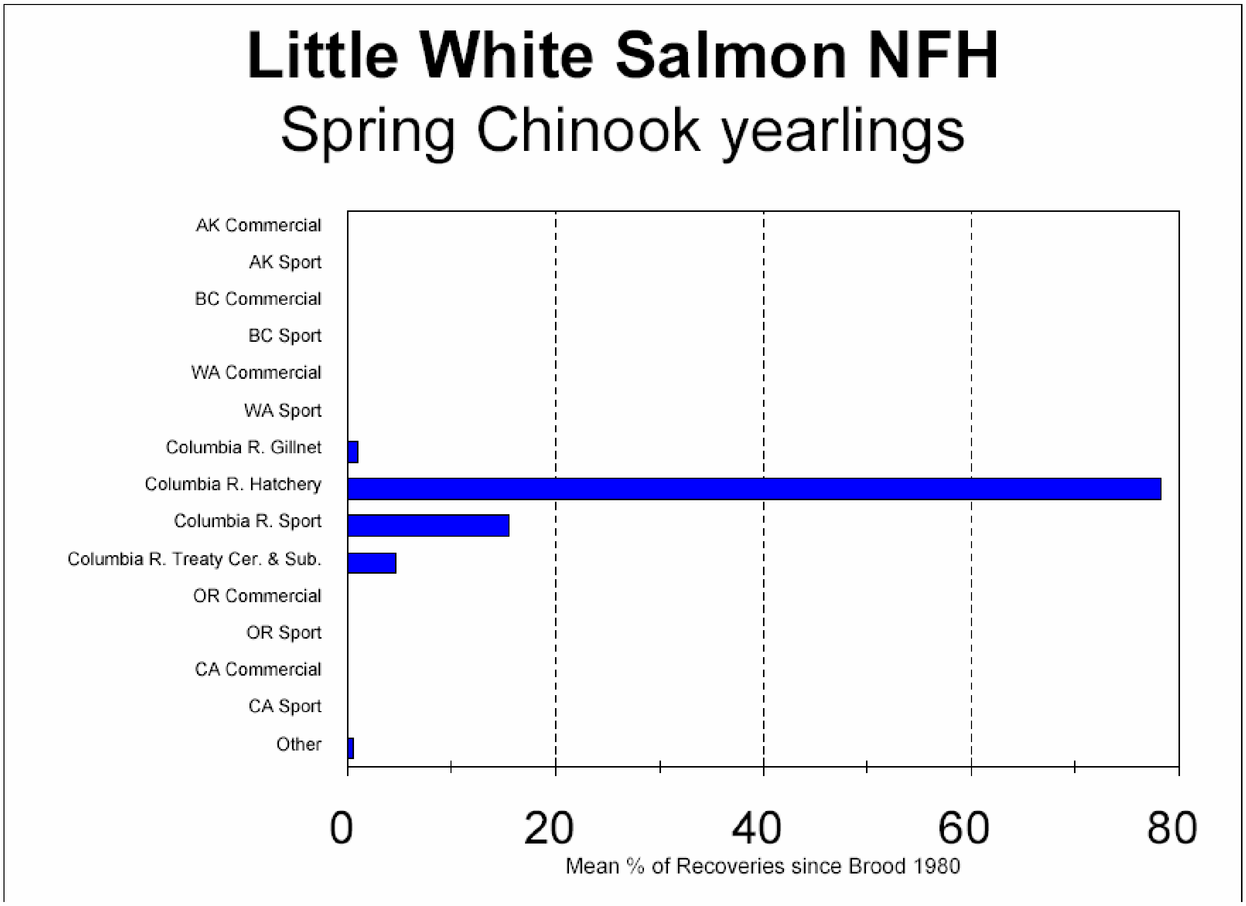
3.3) Relationship to harvest objectives.
Harvest management decisions are made by Washington Dept. of Fish & Wildlife in consultation with state, tribal, and federal co-managers.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Table A. Coded-wire tag recoveries from brood years 1990-1995 spring Chinook salmon. For further details, see Pastor (2001).

Brood Year	Harvest # of Adults	Hatchery Return	Total Return	Harvest Rate
1990	0	260	260	0.0%
1991	0	232	232	0.0%
1992	2,531	2,895	5,426	46.6%
1993	1,055	1,246	2,301	45.8%
1994	18	352	370	4.9%
1995	328	2,381	2,709	12.1%

Graph A. Adult Harvest of Little White Salmon NFH Spring Chinook Salmon. (Pastor, 2001). Analysis of tag recoveries from Brood Years 1980 to 1994.



3.4) Relationship to habitat protection and recovery strategies.

This program is an ongoing mitigation program identified in Table 1 of Section IIC of the Artificial Production Review (NWPPC, 1999) and is consistent with the U.S. *v* Oregon Management Plan.

3.5) Ecological interactions.

Salmonid and non-salmonid fishes or other species that could:

1) negatively impact program;

A variety of freshwater and marine predators such as northern pikeminnows, Caspian terns, and pinnipeds, can significantly reduce overall survival rates of program fish. Predation by northern pikeminnow poses a high risk of significant negative impacts on the productivity of hatchery Chinook (SWIG 1984). Based on PIT tags recovered at a large Caspian tern nesting colony on Rice Island, a dredge material disposal island in the Columbia River estuary, 6-25 million of the estimated 100 million out-migrating juvenile salmonids reaching the estuary were consumed by the terns in 1997 (Roby, et al. 1997). The Fish Passage Center (Berggren 1999) estimates, from about 57,000 PIT tag recoveries from Rice Island, that through 1991, about 0.2% of all PIT tagged fish released into the Columbia River showed up on Rice Island. That percentage had increased by a factor of ten by the 1997 and 1998 juvenile salmonid out-migrations, with hatchery and wild steelhead having been the most effected by the increased predation. A NMFS Working Group (NMFS 1997) determined that California sea lion and Pacific harbor seal populations in the three west coast states have risen by 5-7% annually since the mid-1970s. Their predation on salmonids may now constitute an additional factor on salmonid population declines and can effect recovery of depressed populations in some situations. See the ecological interactions discussion below.

2) be negatively impacted by program;

Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Willamette River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Upper Willamette River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). See the ecological interactions discussion below.

3) positively impact program;

Returning Chinook and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system.

4) be positively impacted by program;

A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Reductions and extinctions of wild populations of salmon could reduce overall ecosystem productivity. Because of this, hatchery production has the potential for playing an important role in population dynamics of predator-prey relationships and community ecology. The Service speculates that these relationships may be particularly important (as either ecological risks or benefits) in years of low productivity and shifting climactic cycles.

In addition, wild co-occurring salmonid populations might be benefited as schools of hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. See the ecological interactions discussion below.

The 1999 Biological Assessment for the Operation of Hatcheries Funded by the National Marine Fisheries Service under the Columbia River Fisheries Development Program (NMFS 1999a) and the 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999b) present a discussion of the potential effects of hatchery programs on listed salmon and steelhead populations. The reader is referred to the discussion in those documents.

Nine generalized types of effects that artificial propagation programs can have on listed salmon and steelhead populations were identified. These effects include: 1. Hatchery operation, 2. Brood stock collection, 3. Genetic introgression, 4. Hatchery production (density-dependent), 5. Disease, 6. Competition, 7. Predation, 8. Residualism, and 9. Migration corridor/ocean. Potential effects in these categories may apply to all hatchery programs to one degree or another depending on the particular program design.

A discussion of ecological interactions relative to the Complex's spring Chinook on-station release program follows:

1. Hatchery operation- The water source for the Little White Salmon NFH is withdrawal from the Little White Salmon River, a series springs, and a well. An impassable falls immediately upstream from the Little White Salmon NFH site in the lower Little White Salmon River precludes anadromous fish passage into the upper basin. Water withdrawals for hatchery operation do not impact listed anadromous species because there is essentially no natural spawning or rearing habitat accessible to anadromous species in the basin. Hatchery effluents meet established NPDES release standards criteria and are diluted by the flow in the Little White Salmon River, reducing potential negative impacts to natural stocks.

2. Brood stock collection- Little White Salmon spring Chinook are Carson stock and are not part of either the lower Columbia River Chinook ESU, which is listed as threatened, or the mid-Columbia River spring Chinook ESU which is not listed. Returning spring Chinook are collected for brood stock at the Little White Salmon NFH rack near the mouth of the Little White Salmon River. Stray hatchery spring Chinook from other locations (primarily from Carson NFH and occasionally from upper Columbia and Snake River facilities) do occur at Little White Salmon NFH. Incidental collection of listed upper Columbia and Snake River spring Chinook are believed to be very low based on CWT recoveries and should not have a significant impact on the listed stocks or the genetic integrity of the brood stock at the Complex.

3. Genetic introgression- Little White spring Chinook are not known to contribute to a significant straying problem outside of the local area. There is essentially very little, if any, productive spawning habitat below Little White Salmon NFH at the mouth of the Little White Salmon River (Drano Lake). Historical spring Chinook habitat was inundated by Bonneville

Pool when Bonneville Dam was constructed in 1938. There is no indication that the Carson stock of spring Chinook reared and released at Little White Salmon NFH is negatively impacting other listed stocks through straying and genetic introgression. The very low numbers of non-Carson stock strays that occur on occasion in the Little White Salmon brood stock collection are at a level that should not significantly alter the genetic structure of the Carson stock used in Little White's spring Chinook production program.

4. Hatchery production (density dependent effects)- Complex spring Chinook releases from the facility are moderate in magnitude (typically about 1.0 million spring Chinook smolts) relative to other Columbia River spring Chinook production programs. This level of release is not expected to cause serious density dependent effects in the mainstem Columbia River. Complex spring Chinook are assumed to migrate quickly after release like their Carson NFH counterparts, however, these fish are not currently PIT tagged to verify out-migration timing.

5. Disease- Under the guidance of the USFWS Lower Columbia River Fish Health Center (LCRFHC), Little White Salmon NFH follows the US Fish and Wildlife Service's fish health policy (713 FW in the Fish and Wildlife Service Manual) and Integrated Hatchery Operations Team (IHOT 1995) protocols to produce healthy fish and prevent disease transmission (see sections 9.1.6 and 9.2.7). Most pathogens enter hatcheries through returning adult fish, surface water supplies, and other mechanisms involving direct contact with naturally spawning fish. Procedures used at the hatchery and the LCRFHC reduce pathogen transmission from these sources. The fish health goal for Little White Salmon NFH spring Chinook is to release healthy fish that are physiologically ready to migrate.

Hatchery managers largely understand the strain, abundance, and virulence (epidemiology) of pathogens and parasites in hatchery fish. Recent studies suggest that the incidence of some pathogens in naturally spawning populations may be higher than in hatchery populations (Elliot and Pascho 1994). Indeed, the incidence of high ELISA titers for *Renibacterium salmoninarum*, the causative agent of Bacterial Kidney Disease (BKD), appears, in general, to be significantly more prevalent among wild smolts of spring/summer Chinook salmon than hatchery smolts (Congleton et al. 1995; Elliot et al. 1997). For example, 95% versus 68% of wild and hatchery smolts, respectively, at Lower Granite Dam in 1995 had detectable levels of *R. salmoninarum* (Congleton et al. 1995). Although pathogens may cause significant post-release mortality among hatchery fish, there is little evidence that hatchery origin fish routinely infect naturally produced salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Steward and Bjornn 1990). Many biologists believe disease-related losses often go undetected and that the impact of disease on naturally spawning populations may be underestimated (Goede 1986; Steward and Bjornn 1990). Nevertheless, we are unaware of any studies or documentation in the scientific literature where hatchery fish have infected a naturally spawning population of salmon or steelhead in the Pacific Northwest (see also Campton 1995).

The hatchery takes appropriate measures to control disease and the release of diseased fish, including chemotherapeutant administration to adults and juveniles (see sections 7.7 and 9.2.7). In addition, Little White Salmon NFH spring Chinook are released directly into the Little White Salmon River at the hatchery site near the river mouth and pass only one mainstem Columbia

River dam (Bonneville Dam) en route to the ocean. Therefore, these spring Chinook have a much reduced potential for transmission of disease to other populations relative to other upriver programs which are subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems. Little White Salmon NFH takes extensive measures to control disease and the release of diseased fish. As a consequence, infection of natural fish by hatchery fish would not appear to be a problem.

6. Competition- The impacts from competition are assumed to be greatest in the spawning and nursery areas at points of highest density (release areas) and diminish as hatchery smolts disperse (USFWS 1994). Salmon and steelhead smolts actively feed during their downstream migration (Becker 1973; Muir and Emmett 1988; Sager and Glova 1988). Competition in reservoirs could occur where food supplies are inadequate for migrating salmon and steelhead. However, the degree to which smolt performance and survival are affected by insufficient food supplies is unknown (Muir and Coley 1994). On the other hand, the available data are more consistent with the alternative hypothesis that hatchery-produced smolts are at a competitive disadvantage relative to naturally produced fish in tributaries and free-flowing mainstem sections (Steward and Bjornn 1990). Although limited information exists, available data reveal no significant relationship between level of crowding and condition of fish at mainstem dams. Consequently, survival of natural smolts during passage at mainstem dams does not appear to be affected directly by the number - or density - of hatchery smolts passing through the system at present population levels. While smolts may be delayed at mainstem dams, the general consensus is that smolts do not normally compete for space when swimming through the bypass facilities (Enhancement Planning Team 1986). The main factor causing mortality during bypass appears to be confinement and handling in the bypass facilities, not the number of fish being bypassed.

Juvenile salmon and steelhead, of both natural and hatchery origin, rear for varying lengths of time in the Columbia River estuary and pre-estuary before moving out to sea. The intensity and magnitude of competition in the area depends on location and duration of estuarine residence for the various species of fish. Research suggests, for some species, a negative correlation between size of fish and residence time in the estuary (Simenstad et al. 1982).

While competition may occur between natural and hatchery juvenile salmonids in - or immediately above - the Columbia River estuary, few studies have been conducted to evaluate the extent of this potential problem (Dawley et al. 1986). The general conclusion is that competition may occur between natural and hatchery salmonid juveniles in the Columbia River estuary, particularly in years when ocean productivity is low. Competition may affect survival and growth of juveniles and thus affect subsequent abundance of returning adults. However, these are postulated effects that have not been quantified or well documented.

The release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate from the release site. The Complex's spring Chinook are released into the Little White Salmon River at the Little White Salmon NFH site. It is assumed that they migrate quickly into the mainstem Columbia River migration corridor en route to the ocean, as does the same stock released from Carson NFH, thereby reducing the potential for competitive interactions with listed stocks. There have been no mortalities recorded during saltwater challenges conducted during the last three brood years at the Complex. Released fish have been fully smolted and begin their downstream migration immediately following release. In addition, blood plasma collected from brood year 1995 spring Chinook was analyzed for sodium and potassium concentrations. Those results also indicated that the spring Chinook are functional smolts at time of release. PIT tagging would provide additional, valuable information on the timing of emigration, but would require additional funding. Because Complex spring Chinook releases occur "low" in the Columbia Basin system relative to many other upriver programs, there is reduced opportunity for competitive interactions.

Other observations leading to conclusions regarding the behavior of released smolts included physiological and survival data collected during recent NATURES rearing studies conducted for spring Chinook at Little White Salmon NFH. For several brood years, researchers from the (now) Biological Resources Division of the U.S. Geological Survey collected data to evaluate the use of cover (simulating natural riparian cover) during hatchery rearing to improve the post-release survival of hatchery-reared salmon and to alter their behavior to more closely match wild (naturally produced) fish. In addition to this study, hatchery-reared fish were exposed to predators six months prior to release in an attempt to "teach" them to avoid predators following release. As many as six northern pikeminnow were placed in each of three raceways as part of this predator avoidance study. Preliminary physiological and survival data collected to date for both studies indicate that, although there were no differences detected among treatment groups when compared to control groups, the behavior of hatchery-produced fish from the Complex appears to be normal when compared to naturally produced fish.

There are no natural fish populations that spawn in the target area. Fish headed further up the Columbia River may dip into Drano Lake and hold in the favorable water conditions. Characteristic of steelhead, this species holds in Drano Lake during periods of low Columbia River flow and high water temperature, preferring the cooler Little White Salmon River water during the period of July through August. Since the majority of spring Chinook have entered the hatchery, and this period is sooner than migration of hatchery fall Chinook and coho, it is doubtful that there is any interaction between program fish and any natural fish.

The natural spawning spring Chinook salmon in the Wind River is not a targeted population of the Complex's program. That hatchery-induced population in the Wind River is considered a depressed, non-native, composite production (wild and hatchery fish) population by WDFW (WDF et al. 1993). The NMFS (Myers et al. 1998) considers this population as not an ESA issue, as these fish were not historically present in the watershed. The five-year geometric mean natural spawning population size is 162 fish. The short-term abundance trend (the most recent 7-10 years, based on total escapement) is positive, + 0.1 % per year. The long-term abundance trend (1970-1996) is negative, - 2.9 % per year (Myers et al. 1998). The run of spring Chinook into the White Salmon River is considered extinct (Nehlsen 1991), primarily attributable to dam construction and habitat degradation (Myers et al. 1998).

7. Predation- The Complex's releases of spring Chinook occur at the Little White Salmon hatchery site near the mouth of the river. Predation effects would therefore be limited to the

migration corridor where effects are likely to be reduced relative to spawning and nursery areas. It is likely that Complex spring Chinook have much reduced predatory impacts on natural stocks relative to other yearling releases in natural production spawning and rearing areas. Depending on species and population, hatchery smolts are often released at a size that is greater than their naturally-produced counterparts. In addition, for species that typically smolt at one year of age or older (e.g. steelhead, spring Chinook salmon), hatchery-origin smolts may displace younger year classes of naturally-produced fish from their territorial feeding areas. Both factors could lead to predation by hatchery fish on naturally produced fish, but these effects have not been extensively documented, nor are the effects consistent (Steward and Bjornn 1990). The USFWS (1994) presented information that salmonid predators are generally thought to prey on fish approximately one-third or less their size.

In general, the extent to which salmon and steelhead smolts of hatchery origin prey on fry from naturally reproducing populations is not known, particularly in the Columbia River basin. The available information - while limited - is consistent with the hypothesis that predation by hatchery-origin fish is, most likely, not a major source of mortality to naturally reproducing populations, at least in freshwater environments of the Columbia River basin (Enhancement Planning Team 1986). For example, peak emergence of listed chum salmon at Ives Island, a natural production area below Bonneville Dam, was estimated to occur during the latter half of March in 1999 (2/19/99 fax to Donna Allard from Wayne Vander Naald, ODFW). Out-migrant sampling conducted by the USFWS in 1998 and 1999 in Hardy Creek, which is adjacent to the mainstem Pierce/Ives Island natural production area, indicated that peak emigration of chum fry from this tributary occurred during the first two weeks of March (unpublished data). Based on life history traits, it is expected that most of the chum fry would have emigrated from the natural production area before the mid-April release of larger hatchery Chinook occurs at the Complex. The potential for the Complex smolts to prey on emerging chum fry would not be significant. However, virtually no information exists regarding the potential for such interactions in the marine environment.

The presence of large numbers of hatchery fish may also alter the listed species behavioral patterns, which may influence vulnerability and prey susceptibility (USFWS 1994). Releasing large numbers of hatchery fish may also lead to a shift in the density or behavior of non-salmonid predators, thus increasing predation on naturally reproducing populations. Conversely, large numbers of hatchery fish may mask or buffer the presence of naturally produced fish, thus providing sufficient distraction to allow natural juveniles to escape (Park 1993). Prey densities at which consumption rates are highest, such as northern pikeminnow in the tailraces of mainstem dams (Beamesderfer et al. 1996; Isaak and Bjornn 1996), have the greatest potential for adversely affecting the viability of naturally reproducing populations, similar to the effects of mixed fisheries on hatchery and wild fish. However, hatchery fish may be substantially more susceptible to predation than naturally produced fish, particularly at the juvenile and smolt stages (Piggins and Mills 1985; Olla et al. 1993).

Predation by birds and marine mammals (e.g. seals and sea lions) may also be significant source of mortality to juvenile salmonid fishes, but functional relationships between the abundance of smolts and rates of predation have not been demonstrated. Nevertheless, shorebirds, marine fish, and marine mammals can be significant predators of hatchery fish immediately below dams and in estuaries (Bayer 1986; Ruggerone 1986; Beamish et al. 1992; Park 1993). Unfortunately, the degree to which adding large numbers of hatchery smolts affects predation on naturally produced fish in the Columbia River estuary and marine environments is unknown, although many of the caveats associated with predation by squawfish in freshwater are true also for marine predators in saltwater.

8. Residualism- Complex spring Chinook releases are not known to residualize in the Little White Salmon or Columbia rivers. PIT tagging would help to provide information relative to hatchery out-migration questions.

9. Migration corridor/ocean- The hatchery production ceiling called for in the Proposed Recovery Plan for Snake River Salmon of approximately 197.4 million fish (1994 release levels) has been incorporated by NMFS into their recent hatchery biological opinions to address potential mainstem corridor and ocean effects as well as other potential ecological effects from hatchery fish. Although hatchery releases occur throughout the year, approximately 80 percent occur from April to June (NMFS 1999a) and Columbia River out-migration occurs primarily from April through August. The Complex's spring Chinook production is typically released in April, at the beginning of the general out-migration season for other hatchery and natural populations. The total number of hatchery fish released in the Columbia River basin has declined by about 26 percent since 1994 (NMFS 1999c) reducing potential ecological interactions throughout the basin.

Ocean rearing conditions are dynamic. Consequently, fish culture programs might cause density-dependent effects during years of low ocean productivity, especially in nearshore areas affected by upwelling (Chapman and Witty 1993). To date, research has not demonstrated that hatchery and naturally produced salmonids compete directly in the ocean, or that the survival and return rates of naturally produced and hatchery origin fish are inversely related to the number of hatchery origin smolts entering the ocean (Enhancement Planning Team 1986). If competition occurs, it most likely occurs in nearshore areas when (a) upwelling is suppressed due to warm ocean temperatures and/or (b) when the abundance or concentration of smolts entering the ocean is relatively high. However, we are only beginning to understand the food-chain effects of cyclic, warm ocean conditions in the eastern north Pacific Ocean and associated impacts on salmon survival and productivity (Beamish 1995; Mantua et al. 1997). Consequently, the potential for competition effects in the ocean cannot be discounted (Emlen et al. 1990).

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Water rights for the Little White Salmon NFH total 33,868 gpm from the Little White Salmon River, a small well and springs. Water use for fish production ranges from 11,221 gpm to 28,232 gpm. The river supplies most of this water flow. The water intake

structure was rebuilt in 1994 and modified in 2001. A water re-use system was constructed in 1967 for egg incubation, but has not been operated for several years. The re-use system was originally used to supplement water supplies for incubation in low water years, but has not been needed since the well was upgraded. Use of the reused water is avoided whenever possible due to disease transmission concerns.
An independent hatchery audit (Montgomery Watson 1997) measuring hatchery operations against IHOT standards (IHOT 1995) reported a remedial action was needed to provide disease-free water for incubation and early rearing (4,700 gpm). The estimated cost was $2.7 million. Such a system would also benefit the incubation of fall Chinook and coho salmon.

The Complex's water intake structure was examined during the independent audit (Montgomery Watson 1997). The structure was in compliance when measured against NMFS's screening criteria for approach velocity and screen openings. The hatchery monitors water discharges and is in compliance with the NPDES permit.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

As stated above in section 4.1, the hatchery intake structure is above an impassable barrier dam which prevents listed anadromous species from having access to the main water supply. The hatchery's effluent discharge is well within it's NPDES permit and is further diluted by the Little White Salmon river further reducing any possible negative impacts.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Fish enter the spawning facility volitionally via a fish ladder that opens immediately below the hatchery barrier dam. Once inside the trap, the fish are held in a 30' X 90' X6' holding pond.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Adult fish are moved from pond to pond and into the anesthetic tank using hydraulically operated mechanical crowders.

5.3) Broodstock holding and spawning facilities.

Brood holding facilities include two 30' X 90' X 6' holding ponds. Spawning facilities include a transfer tower to move fish from the holding ponds into the anesthetic tank where fish are sorted. Fish not ready to spawn (green fish) are returned to the holding ponds via return tubes. Ripe fish are handled on a stainless steel spawning table.

5.4) Incubation facilities.

Incubation is done in the nursery building about 0.5 km from the spawning facility using up to 36 of 132 stacks of vertical incubators with flows set initially to 3 gpm and raised to 5 gpm at hatching. Water for incubation is primarily from springs and a well, with screened river water available if needed. The eggs are treated with 1,667 ppm formalin for fifteen minutes between three and five times a week to control fungus. The formalin is delivered using a newly constructed delivery system which ensures proper dilutions and timing. The installation of egg isolation units has been proposed to prevent potential disease transmission from eggs transported from outside the facility to Little White Salmon stocks.

5.5) Rearing facilities.

Rearing is performed in newly constructed (2001-2002) 10' X 110' X 3.5' mocha colored raceways with maximum flows of approximately 800 gpm, as well as in nine 8’ X 80’ concrete raceways (flows up to 470 gpm) and two new 10’ X 210’ X 3.5’ colored concrete raceways (flows up to 2,000 gpm). Baffles are being evaluated in the new raceways to determine their usefulness with these fish.

5.6) Acclimation/release facilities.

Fish are released directly from the raceways into the Little White Salmon River below the barrier dam.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

There have been no operational difficulties or disasters that have led to significant fish mortality.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

The hatchery has low water alarm probes positioned in several locations to prevent fish losses due to water system failures. The alarm system is equipped with radio pagers and an automatic phone dialer in case of emergency. Fish disease transmission is managed in accordance with the US Fish and Wildlife Service’s fish health policy and IHOT recommendations.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

On-station releases into the Little White Salmon River:

- Adult spring Chinook returning to the Little White Salmon River.

Umatilla program:

- Adult spring Chinook salmon collected at Three Mile Dam on the Umatilla River by CTUIR.

6.2) Supporting information.

6.2.1) History.

The spawning of spring Chinook salmon at the Complex first occurred in 1967 when fish of unknown origin returned to the Little White Salmon River (Nelson and Bodle 1990). These fish could have been strays or descendants from previous attempts to rear spring Chinook from the McKenzie River (1916 brood), Salmon River (1925 brood), or Carson stock reared at Willard during the 1964 brood year. Since that time, fish were released into the Little White Salmon River from Willamette stock (Eagle Creek NFH), South Santiam State Fish Hatchery, Klickitat River stock, Ringold Springs stock, and Carson stock. The present stock is considered a derivative of the Carson stock. Part of the 1995 brood included adult fish trapped on the White Salmon River (progeny of Carson stock reared and released at Big White Salmon Ponds). Fish originating from White Salmon River adults (released in 1997) were the only fish released since 1985 that did not originate from adults returning to the Complex.

6.2.2) Annual size.

Spring Chinook enter the hatchery holding ponds from mid-April to mid-August. Spawning occurs from early August to early September. A summary of numbers spawned from 1991 through 2002 is found in Section 7.4.2. Total adult returns ranged from 615 to 8,243, averaging 2,982 per year for this period. The annual escapement goal is 900 adults returning to the hatchery (see Section 1.11.1 and Section 7.4.2).

6.2.3) Past and proposed level of natural fish in broodstock.

As stated in Bryant (1949), the backwater from Bonneville Dam covers all of the area that was originally suitable for salmon spawning. In addition, a natural waterfall located about 0.8 kilometers above the hatchery barrier dam (built in 1974) had historically blocked access to spawning habitat located above the hatchery. Fluctuations in the level of the Bonneville Pool are seen immediately below the barrier dam. Historical literature reviews indicate that the only original native stock were the Tule fall Chinook and late-run coho (Nelson and Bodle 1990). Both are extinct from the watershed and there are no naturally spawning populations. Remnants of the original Tule stock were transferred to Spring Creek NFH during the mid-1980's. There has been no past or proposed future level of natural fish used as brood stock for the spring Chinook currently produced at the Little White Salmon/Willard NFH Complex.

6.2.4) Genetic or ecological differences.

As stated in section 2.2.2 above, there are no natural stocks in the Little White Salmon River.

6.2.5) Reasons for choosing.

All stocks of spring Chinook were chosen due to their availability. Refer to Section 1.7 of this document for further details.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

No adverse genetic effects to listed species are expected from the spring Chinook broodstock selection process. See Section 3.5 of this document for a detailed discussion on this topic.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults.

7.2) Collection or sampling design.

All fish production for the Complex is initiated by adult collection at Little White Salmon NFH. An impassable natural waterfall, located approximately 0.8 kilometers upstream of the Little White Salmon facility prevents adult passage to Willard NFH.

Returning adult fish migrate through Drano Lake (backwater of the Bonneville Pool at the mouth of the Little White Salmon River) and up the Little White Salmon River, before entering the hatchery ladder. To facilitate and maximize adult collection, further migration is prevented by a concrete barrier dam. Constructed in 1974, the fish ladder and barrier dam were built in anticipation of new peaking levels at Bonneville Dam (USFWS 1987). River water is supplied to two 30' wide X 90' long X 6' deep adult holding ponds. Water exiting the ponds, in addition to a separate attraction water intake, supplies water to the fish ladder. Adult fish migrating up the ladder enter the ponds through a finger weir.

The hatchery ladder is opened during the 3rd week of April to begin the collection of adult spring Chinook. Historical records show that a majority of the fish enter the hatchery during the month of May, however, the ladder is operated throughout the spawning period to ensure collection of fish from the entire spectrum of the run. Spawning historically occurs between August 1 and September 7. The hatchery ladder is closed at the end of spawning to prevent the possible collection of stray tule fall Chinook from Spring Creek NFH.

During the later part of the spring Chinook return some steelhead may enter the adult holding ponds. Procedures at the Complex require unmarked steelhead (presumably wild) to be returned to the river immediately if they have not been exposed to the anesthetic tricaine methane sulfonate (MS-222). The steelhead are returned to the river via a return tube that empties below the entrance to the fish ladder. Generally, the steelhead are removed from the adult holding ponds as the Chinook are sorted for spawning. Unmarked steelhead exposed to MS-222 will be returned to the river only if the full 21 days of required holding for chemical withdrawal is possible. The steelhead are to be placed into a holding raceway for 21 days and then transported to an area below the hatchery barrier dam and released. All marked steelhead (adipose fin clipped hatchery strays) will be retained. Coded-wire tags will be collected from all adipose/left ventral clipped steelhead to determine the origin (see section 10.4.5). The expected number of steelhead entering the adult holding ponds each year is low. The numbers of steelhead entering the holding ponds from 1991 through 1999 has ranged from 0 to 14 (1995). The average is less than 4 per year. Records have been kept of marked versus unmarked steelhead entering the hatchery since 1998. In 1998 three steelhead entered the hatchery, one of which was unmarked. No steelhead entered the hatchery in 1999.

7.3) Identity.

Spring Chinook released into the Little White Salmon River are mass marked using an adipose fin clip. The mass marking program commenced with Brood Year 2000. A portion of the population (approximately 10%) also receive a coded wire tag. All spring Chinook must be run through a wire tag detector to facilitate tag recovery. Tag code recoveries are reported to the Pacific States Marine Fish Commission (PSMFC) following the spawning season.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

Approximately 900 adult spring Chinook need to return to the hatchery for full normal production. The sex ratio of returning adult spring Chinook is skewed towards females with approximately 65% of the return being female with 35% of the run male.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

The following table shows the number of fish spawned. Total number of returns to the hatchery may be higher (see Section 6.2.2). Data source: Spawning and Run Summary for indicated years as found in the CRiS database.

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1991	731	446	0		
1992	747	432	0		
1993	799	736	0		
1994	302	228	3		
1995	202	182	21		
1996	539	508	12		
1997	401	396	3		
1998	653	367	14		
1999	424	368	12		
2000	419	383	28		
2001	405	379	12		
2002	438	424	3		
Average	505	404	8		

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Excess adult Chinook are culled at random through the spawning season to keep the hatchery within program goals. See Section 7.8 for discussion of carcass disposal.

7.6) Fish transportation and holding methods.

It is generally not required to transport adult spring Chinook. The holding period for spring Chinook is quite long, up to four months. During that time, adult fish that are to be spawned are injected with erythromycin to control bacterial kidney disease (BKD). They are also treated with formalin at a rate of 167 ppm in a one hour flowthrough treatment three to five times a week to control fungus growth. The Complex goal for all species is to achieve a 2.5% or less pre-spawning mortality rate during the holding period.

7.7) Describe fish health maintenance and sanitation procedures applied.

All female spring Chinook salmon held for broodstock are injected with 10 mg/kg erythromycin to prevent pre-spawning mortality by bacterial kidney disease (BKD), and to reduce vertical transmission of its causative agent to their progeny. The more commonly administered dose of erythromycin (20 mg/kg) has been shown to cause an increase in pre-spawning mortality in this stock of fish due to toxicity of the drug. The lower dose remains effective in reducing mortalities from BKD in the broodstock and reducing vertical transmission to the progeny (Haukenes and Moffitt, 1999; Haukenes and Moffitt, 2002). Formalin treatments at 167 ppm for one hour, three to five times per week control fungus and external parasites during the holding period. Sanitation procedures meet or exceed the minimum guidelines set forth in the IHOT report (1995) and are described in detail in section 8.3.

At spawning, tissues from adult fish are collected to ascertain viral, bacterial, and parasitic infections and to provide a brood health profile. The minimum number of samples collected is defined by USFWS policy 713 FW (Fish and Wildlife Service Manual). Personnel from the Lower Columbia River Fish Health Center test for the parasite *Ceratomyxa shasta* and all of the listed pathogens: infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum* (BKD), *Aeromonas salmonicida* (furunculosis), *Yersinia ruckeri* (enteric redmouth); except for *Myxobolus cerebralis*. All female broodstock are tested for BKD by the Enzyme-Linked Immunosorbent assay (ELISA). The results of this test allow the hatchery to cull or segregate eggs from the females with high titers of the antigen, decreasing the possibility that the vertically transmitted disease (from mother to progeny) could be transmitted horizontally (from progeny to progeny). The LCRFHC provides results from this test within 28 days to allow for management decisions (see section 9.1.3).

7.8) Disposition of carcasses.

During the early part of the run, these fish are not chemically treated and are fit for human consumption. First priority for excess carcasses is provided to the Yakama Indian Nation ceremonial and subsistence program. All other excess carcasses are processed by contractors for the U.S. Department of Justice, Federal Prisons Program. After the erythromycin injections the fish are not fit for human consumption and are either sent to a rendering plant or are buried on station.

Carcass outplanting for nutrient enhancement is not currently a goal of this program. However, if current policies change to include nutrient enhancement, outplanting will be done as per LCRFHC recommendations to minimize potential disease transmission to resident and anadromous fish. These recommendations include outplanting carcasses with no gross signs of disease, heat-treating or eviscerating adult carcasses and removing heads before outplanting, and placing carcasses downstream of the hatchery intake.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

There are no known listed natural fish in the target watershed. The risk of disease transmission will be minimized by following IHOT sanitation and fish health maintenance and monitoring guidelines.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Broodstock are collected to represent the full spectrum of the run. Fish are sorted over a one to two day period with ripe females being spawned and green females sent back to the ponds until 100% of the fish have been checked. Enough male fish are sent back to the pond with the green females to ensure a 1:1 spawning ratio. The eggs collected during this sorting process are considered a "take". Male spawners are randomly selected during the take with up to five percent of males used being jacks. The number of jacks spawned on a given day is subjectively defined by hatchery staff up to the five percent maximum and is dependent on availability and ripeness. After all fish have been sorted once and ripe females spawned, a maximum one week period is allowed to pass before the fish are re-sorted and newly ripened females spawned. The objective is to achieve maximum fertilization by spawning fish soon after ovulation and yet avoid the needless handling of green females. The re-sorting process continues until all fish are spawned. Since there are no naturally spawning spring Chinook in the watershed, differentiating spawners based on natural stock origin from within the watershed is not a criteria.

8.2) Males.

If the hatchery escapement goal is met, then a 1:1 spawning ratio will be achieved. Achieving this spawning ratio is one of the highest brood stock program goals at the Complex. During low escapement years, males have been re-used on an as-needed basis to maximize the total number of females available to spawn. In low escapement years it is better to spawn the available females (and not lose that genetic material), than discard them. Under these conditions, reusing male fish does not compromise the genetic diversity of the hatchery stocks. It was determined that, in all instances, a minimum escapement need had been met to maintain genetic diversity, although some male fish had to be reused to achieve production goals.

8.3) Fertilization.

It is important to note that at no time in the recent past has the Complex pooled the eggs of females prior to fertilization. Again, as mentioned in section 7.2 above, an intense effort is made to achieve a 1:1 spawning ratio. The following is a detailed description of the spawning protocol.

Adults are crowded from holding ponds and anesthetized using MS-222. Anesthetized adults are then sexed and checked for ripeness. Ripe adults are selected and euthanized.

Tails of all ripe females spawned are cut to allow bleeding for approximately 3-5 minutes. Each female is tagged with a numbered tag that is recorded and remains with the eggs from that fish until the eggs are eyed up to facilitate tracking of the eggs (see Section 9.1.3). Prior to removing the eggs, Fish Health Center employees collect samples of ovarian fluid from 150 fish to test for the presence of viruses. Eggs are removed using a Wyoming knife and collected in iodophor-disinfected colanders to drain ovarian fluid. The eggs are then transferred to iodophor-disinfected stainless steel buckets and sperm is added directly to the eggs. A 1:1 random spawning ratio is maintained and male jacks are used proportionally to their percentage of the run to a maximum of 5%. The numbered buckets containing eggs and sperm of individual (paired) fish are then transferred to the Little White Salmon hatchery nursery building (0.5 kilometers away) where water is added to activate the sperm. The above described process takes from 5-10 minutes. The fertilized eggs are gently stirred and allowed to rest for a minimum of thirty seconds, then washed and water hardened for one half hour in a 75 ppm active iodine solution in individual Heath incubator trays. The eggs are incubated using single pass spring and/or well water.

Aseptic procedures are followed to assure the disinfection of equipment throughout the egg handling process. Tissue samples are collected by fish health specialists to determine the incidence of *Ceratomyxa shasta*, and all of the listed pathogens except *Myxobolus cerebralis,* according to procedures and guidelines in 713 FW and IHOT. Refer to sections 9.1.6 and 9.2.7 for more fish health details.

8.4) Cryopreserved gametes.
Gametes are not cryopreserved at the Little White Salmon NFH.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.
There are no known listed natural fish that will be adversely affected by the above described mating scheme.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

BROOD YEAR	EGGS TAKEN	% SURVIVAL TO EYE	% SURVIVAL GREEN TO POND	% SURVIVAL POND TO RELEASE
1989	4,134,045	90.5	89.9	84.4
1990	3,493,268	81.7	79.6	78.3
1991	3,207,155	78.3	73.1	65.1
1992	2,981,646	96.3	93.1	82.7
1993	3,718,222	91.3	82.8	89.5
1994	1,307,102	92.2	89.9	92.1
1995	900,581	95.9	94.8	95.5
1996	2,190,460	94.1	93.6	96.0
1997	1,961,472	93.9	89.7	97.1
1998	2,419,139	94.2	93.6	97.8
1999	1,716,264	94.5	92.0	90.0
2000	1,732,592	95.1	93.9	95.9
Average	2,480,162	91.50	88.83	88.70

9.1.2) Cause for, and disposition of surplus egg takes.

Extra eggs may be taken to safeguard against potential incubation losses and to allow culling based on levels of *R. salmoninarum*. Excess eggs are buried on-station.

9.1.3) Loading densities applied during incubation.

Eggs are placed into incubation trays at a rate of one female (approximately 4000 eggs) per incubation tray. Each tray is tagged with a number corresponding to the female spawned. When Fish Health personnel have completed the tests for BKD, eggs from females with a bacterial antigen level (corresponding to the infection level) above a set limit are disposed of or segregated from the rest of the population. At eye-up, the eggs are shocked, dead eggs are removed, the remaining eggs are enumerated and then placed back into incubation trays at a rate of 5000 eggs per tray. Initial water flows are set at 3 gpm and increased to 5 gpm at hatch.

9.1.4) Incubation conditions.

Water temperature is monitored using temperature loggers taking readings every 30 minutes. Temperatures during incubation range from 43°F to 50°F with typical temperatures around 47°F. Dissolved oxygen levels are not regularly monitored, but have been tested and found to be at, or near saturation. All water for incubation is passed through a 70 micron drumscreen to filter out solids.

9.1.5) Ponding.

Fish are transferred to the nursery tanks from egg trays when most individuals have absorbed their yolk sac (at around 1,700 Temperature Units, TUs). At this time, eggs destined for an individual tank are emptied into a transport vessel, moved to the appropriate tank and released directly into the tank (i.e. swim up and ponding are forced) in December and early January. The fish are held in the tanks and fed using automatic feeders until they are large enough to be moved into the raceways and/or the next take of fry needs the tank space. At this time the fish are loaded by net into a 400 gallon transport tank and moved to the 8' X 80' raceways. Average length at initial ponding is 33mm.

9.1.6) Fish health maintenance and monitoring.

The current treatment to control fungus on the eggs is a 1,667 ppm drip of formalin for 15 minutes three to five times a week. The first health exam of newly hatched fish occurs when approximately 50% are beyond the yolk sac stage and begin feeding. Sixty fish are sampled and tested for virus. Regular fish health checks are done on a monthly basis by the fish health specialist from the Lower Columbia River Fish Health Center as per the fish health policy in 713 FW.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

There are no known listed fish that will be affected by incubation procedures.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

Refer to table in Section 9.1.1 of this document.

9.2.2) Density and loading criteria (goals and actual levels).

Current production goals are to have a final density index of below 0.25 and a flow index of no higher than 1.5 (ref. Fish Hatchery Management, Piper et.al., 1982). Maximum density and loading criteria are for maximum loadings of 4.5 lbs/gpm or 0.87 lbs/ft^3.

9.2.3) Fish rearing conditions

Fingerling spring Chinook are held in the 8' X 80' raceways until mid-May when they are moved to the new colored raceways described in Section 5.5 and Section 9.2.9. Temperature readings are monitored using data loggers taking readings every 30 minutes. Temperatures in the raceways range from 38°F to 49°F during the year. Mortalities are removed daily and raceways are cleaned with a broom while effluent water is drained to a pollution control structure. Cleaning is performed as needed but no less than once a week. Dissolved oxygen, carbon dioxide and total gas pressure have never been problems and are not recorded on a regular basis. Fish are reared on river water for most of their rearing cycle.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Table B: End of Month Growth Parameters for LWS NFH Spring Chinook Brood Year 2000.

Month	Length	#/lb	Condition Factor C	Conversion For Month	Density Index	Flow Index
December, 2000	1.417	976		1.53	0.09	0.63
January, 2001	1.724	542		1.18	0.10	0.59
February	1.977	359		1.65	0.13	0.89
March	2.414	197		0.97	0.20	0.90
April	2.827	123		1.01	0.28	0.93
May	3.308	76.7		0.83	0.30	0.98
June	3.547	62.2		1.39	0.34	1.13
July	3.949	45.1		1.27	0.17	0.53
August	4.309	34.7		1.22	0.20	0.64
September	4.746	26.0		1.16	0.24	0.77
October	4.822	24.8		3.86	0.25	0.80
November	4.866	24.1		3.26	0.20	0.95
December	4.953	22.9		1.52	0.22	1.13
January, 2002	5.043	21.7		1.71	0.23	1.17
February	5.154	20.3		1.55	0.24	1.22
March	5.416	17.5		1.03	0.26	1.35
April*	5.771	15.8	0.000330	0.97	0.27	1.40

Data from Lot History, Production for Brood Year 2000 spring Chinook.
* Fish released April 18, 2002.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.
Energy reserve information is not available. Refer to Section 9.2.4 for growth data.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/g.p.m. inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).
The fish are fed BioMoist starter, grower and feed following manufacturer recommendations (generally between 3.5% and 0.5% of body weight per day). They are fed between two and nine times daily depending on fish size. Overall conversions are around 1.1.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
The Lower Columbia River Fish Health Center (LCRFHC) in Underwood, WA provides fish health care for the Little White Salmon NFH as described in the published policy 713 FW in the Fish and Wildlife Service Manual. In addition to this policy, the 1995 annual report "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries", chapter 5, by the Integrated Hatchery Operations Team provides further fish health guidelines as approved by state, federal, and tribal agencies. The directives of these two documents exceed the requirements of the Washington State and Tribal fish health agencies which follow the directives in the Washington Co-Managers Salmonid Disease Control Policy of 1998.

The documents mentioned above provide guidance for preventing or minimizing diseases within and outside of the hatchery. In general, movements of live fish into or out of the hatchery must be approved by the Production Advisory Committee (PAC) and be noted on the Brood Document for the hatchery. If a fish transfer or release is not on the Brood Document, permits from the Washington Department of Fish & Wildlife, the USFWS, and any other states through which the fish travel must be obtained and approved by co-managers. Fish health exam and certification must be done prior to any releases or transfers from the hatchery to minimize risks from possible disease transmittance.

A pathologist from the LCRFHC visits at least once per month to examine fish at the hatchery. From each stock of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes an external and internal examination of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) will be checked for the common bacterial pathogens by culture and by a specific test for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other infections, including viral anemia. Additional tests for virus or parasites are done if warranted.

A diagnostic exam is done on an as-needed basis determined by the pathologist or requested by hatchery personnel. Sick, dying, and/or fish with unusual behavior are examined for disease with appropriate diagnostic tests. A pathologist will normally check symptomatic fish during a monthly examination.

Spring Chinook are given prophylactic medicated feedings once in July at a rate of 100 mg erythromycin/kg fish/day for 21 days. Administration of erythromycin in mid-summer appears to control outbreaks of bacterial kidney disease later in the rearing cycle (LCRFHC fish health reports). The dosage and duration can be variable depending on that brood year's susceptibility to drug-induced toxicity. As of 2001, there is a temporary INAD 4333 that allows feeding of Aquamycin 100 (erythromycin thiocyanate in a wheat flour base) and prescription by a veterinarian is not required

At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are tested for the presence of listed pathogens. These pathogens, defined in USFWS policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum, Aeromonas salmonicida, Yersinia ruckeri*, and *Myxobolus cerebralis*.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.
Fish are given a 24 hour saltwater challenge before release and observed for survival and outward signs of smoltification, i.e. loss of parr marks, etc. Survival is typically at or near 100%.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.
New raceways are now being used that are made of colored concrete to better simulate the river bottom where the fish are released. The new raceways are also equipped with baffles to minimize the amount of cleaning necessary and to give the fish a variety of conditions within the raceway to choose from.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.
These fish are not listed. There are no listed fish under propagation at this facility at this time.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	0	-	-	-
Unfed Fry	0	-	-	-

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fry	0	-	-	-
Fingerling	0	-	-	-
Yearling	1,000,000	15	mid-April	Little White Salmon River

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Little White Salmon River at the Little White Salmon NFH

Release point: River kilometer 2 on the Little White Salmon River, entering the Columbia River at river kilometer 261, approximately 45□ 42' 30" North Latitude and 121□ 37' 30" West Longitude (pers. comm. Steve Vigg, NMFS)

Major watershed: Little White Salmon River

Basin or Region: Columbia River

10.3) Actual numbers and sizes of fish released by age class through the program.

Source: LWS NFH Annual Reports, 1990 to 2001.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1990	1,436,415	-	-	-	1,050,126		461,446	15.0/lb
1991	-	-	-	-	-	-	1,016,706	17.0/lb
1992	-	-	-	-	-	-	668,782	16.8/lb
1993	-	-	-	-	-	-	809,079	18.1/lb
1994	-	-	-	-	-	-	994,588	15.9/lb
1995	-	-	-	-	-	-	1,055,864	15.1/lb
1996	-	-	-	-	-	-	986,890	15.3/lb
1997	-	-	-	-	-	-	682,623	15.6/lb
1998	-	-	-	-	-	-	1,063,453	15.6/lb
1999	-	-	-	-	-	-	1,074,173	14.3/lb
2000	-	-	-	-	-	-	1,115,384	14.7/lb
2001	-	-	-	-	-	-	1,016,574	15.9/lb
Average					-	-	912,130	15.78/lb

Data source: LWS NFH annual reports, 1990-2001

10.4) Actual dates of release and description of release protocols.

Releases of fingerlings for the most recent five years occurred between April 12 and April 22. In normal years, the screens are removed from the raceways one or two days before release day to allow some fish to migrate volitionally. On the date of release all remaining fish are forced out of the raceways.

10.5) Fish transportation procedures, if applicable.

The fish covered in this HGMP are not transported off-station.

10.6) Acclimation procedures

The fish are reared on river water through most of the rearing cycle and should be fully imprinted at release.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Approximately 10% of the fish released from Little White Salmon NFH are coded wire tagged. One hundred percent of the fish receive an adipose fin clip.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Any fish identified as excess to program needs are destroyed. This has not occurred since the inception of the program.

10.9) Fish health certification procedures applied pre-release.

At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are tested for the presence of the listed pathogens. These pathogens, defined in USFWS policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum, Aeromonas salmonicida, Yersinia ruckeri*, and *Myxobolus cerebralis*.

10.10) Emergency release procedures in response to flooding or water system failure.

Every effort will be made to avoid emergency releases. Emergency releases, if necessary, would be accomplished by removal of outlet screens and damboards at the lower end of the raceways. This is the same method used for final scheduled releases.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Fish health procedures outlined in this document and listed in the Fish and Wildlife Service's fish health policy as well as the IHOT document, minimize potential negative effects on natural populations of fish by lessening the chance for horizontally transmitted diseases when encountering Little White Salmon spring Chinook in the migration corridor or in the ocean. Bacterial kidney disease control measures include segregation and/or culling of eggs based on ELISA results and prophylactic treatments of erythromycin in juveniles. See sections 3.5, 7.7, and 9.2.7 of this document for a detailed discussion of potential ecological interactions and fish health procedures.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.
Refer to Section 1.10 of this document for information on the Performance Indicators.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.
The existing monitoring and evaluation work for the spring Chinook program has been in place since the inception of the program, continuously funded by NMFS as provided under the Mitchell Act.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.
Design and implementation of all research activities associated with monitoring and evaluation of the spring Chinook program operations follow peer review by internal (USFWS) staff as well as external interested parties including NMFS, WDFW, and ODFW and various academic entities.

SECTION 12. RESEARCH

12.1) Objective or purpose.
There is currently no research beyond normal monitoring and evaluation of the stock using CWT tags due to the recent construction on the new raceways. Research projects in the coming years may include density studies, feed trials, and evaluation of baffled vs. unbaffled raceways. These studies will be necessary to evaluate performance of the spring Chinook in the new, larger, colored, raceways. These studies should have no effect on listed species.

12.2) Cooperating and funding agencies.

This program currently has no funding allocated for research.

12.3) Principle investigator or project supervisor and staff.

Speros Doulos (Complex Manager), Jim Rockowski (Deputy Complex Manager), Peter Long (Fishery Biologist), Mary Stad (Fishery Biologist)

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Not listed.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

N/A

12.6) Dates or time period in which research activity occurs.

N/A

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

N/A

12.8) Expected type and effects of take and potential for injury or mortality.

N/A

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

N/A

12.10) Alternative methods to achieve project objectives.

N/A

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

N/A

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

N/A

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. **(Anadromous salmonid effects are addressed in Section 2)**

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

Section 7 permits were obtained for construction projects from NMFS (WSB-00-360 dated 06/28/2000 good through 09/30/2001) and from an Internal Section 7 Consultation (permit number 1-3-00-FW-1914, 1915) from the USFWS Western Washington Office in Lacey, Washington.

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Species	Status	Projected take
1) **Bald Eagle (*Haliaeetus leucocephalus*)**	Listed	None
2) Northern spotted owl(*Strix occidentalis caurina)*	Listed	None
3) Bull trout (*Salvelinus confluentus*)	Listed	None
4) California wolverine (*Gulo gulo luteus*)	Concern	None
5) Cascades frog (*Rana cascadae*)	Concern	None
6) **Larch Mtn salamander (*Plethodon larselli*)**	Concern	None
7) Long-eared myotis bat (*Myotis evotis*)	Concern	None
8) Long-legged myotis bat (*Myotis volans*)	Concern	None
9)Northern goshawk (*Accipiter gentilis*)	Concern	None
10) Northwestern pond turtle (*Clemmys marmorata marmorata*)	Concern	None
11) Olive sided flycatcher (*Cantopus cooperi*)	Concern	None
12) Pacific Townsend's big-eared bat (*Corynorhynus townsendii townsendii)*	Concern	None
13) Pacific lamprey (*Lampetra tridentata*)	Concern	None
14) River lamprey (*Lampetra ayresi*)	Concern	None
15) **Tailed frog (*Ascaphus truei*)**	Concern	None
16) Western toad (*Bufo boreas*)	Concern	None
17) *Penstemon barrettiae* (Barrett's beardtongue)	Concern	None
18) *Rorippa columbiae* (Columbia yellow-cress)	Concern	None
19) *Sisyrinchium sarmentosum* (pale blue-eyed grass)	Concern	None

Species in **bold** were specific occurrences located on the database within a one mile radius of the project site.

15.3) Analyze effects.

None of the above listed species is likely to be adversely affected by this program. See section 3.5 of this document for detailed information on program effects on aquatic species.

15.4 Actions taken to minimize potential effects.

15.5 References

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: ________________________ **ESU/Population:**_______________________________ **Activity:**___________________				
Location of hatchery activity:_____________________ **Dates of activity:**___________________ **Hatchery program operator:**________________				
Type of Take	**Annual Take of Listed Fish By Life Stage** ***(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and released)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.